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2011.0 RANGE ROVER (LM), 303-07B

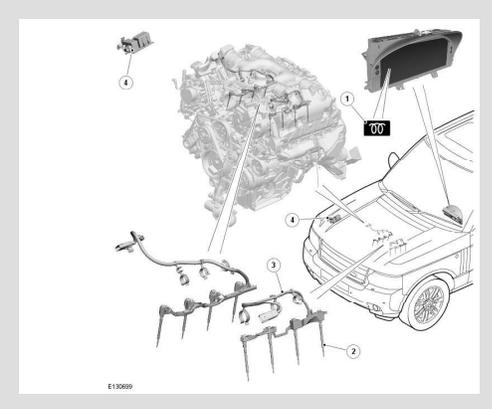
GLOW PLUG SYSTEM - TDV8 4.4L DIESEL (G1311594)

DESCRIPTION AND OPERATION

COMPONENT LOCATION

NOTE:

left-hand drive (LHD) shown



ITEM	DESCRIPTION
1	Glow plug warning lamp
2	Glow plugs (8 off)
3	Glow plug harness
4	Glow plug modules

OVERVIEW

The glow plug system has a glow plug installed in the inlet side of each cylinder. The glow plugs heat the combustion chambers before and during cranking, to aid cold starting, and after the engine starts to reduce emissions and engine noise when idling with a cold engine. Glow plug operation is controlled by two glow plug modules and the engine control module (ECM).

Each bank of glow plugs is connected via a separate harness to its respective glow plug module. Each glow plug module is controlled by glow plug software contained within the engine control module (ECM).

COMPONENT DESCRIPTION

GLOW PLUGS

The ceramic sheathed element glow plugs are made from a heat-resistant, electrically conductive ceramic material. The ceramic sheathed-element glow plugs outer layer is heated directly and is self regulating. The self regulation allows the resistance of the sheathed element to automatically increase as the heat increases preventing the glow plug from overheating. In addition, during the heating process and under the control of the glow plug relay, the glow plugs can be operated above their nominal voltages. This permits heat-up speeds of 1000°C per second. The sheathed-element glow plugs reach a maximum glow temperature of 1300°C and can hold a temperature of 1150°C for several minutes after the first-start glow or at intervening times.

Each cylinder bank has a separate harness connecting the 4 glow plugs. The harness connects into the respective glow plug module for that bank.

The glow plug modules receive a battery voltage feed via a 60A fuse in the battery junction box (BJB). Operation of the glow plug modules is controlled by the ECM, which also controls the illumination of the glow plug indicator in the instrument cluster.

The system has been designed as a low-voltage glow system. At 7 volts, the nominal voltage of the sheathed-element glow plugs is significantly lower than the 12 volts of the main electrical circuit. The electronic glow plug modules match the voltage to the sheathed-element glow plugs and control their glow temperature precisely to the specific requirements of the engine. This produces the optimum glow temperature even when the main circuit voltage is interrupted during engine starting. The lower power consumption of the ceramic glow plugs and their time-staggered activation, reduce to a minimum the peak load on the main circuit during the cold start and immediate post-start periods.

In the event of glow plug failure, the engine may be difficult to start at ambient temperatures of -5°C (23°F) or below.

SYSTEM OPERATION

There are three phases of glow plug heating: Pre heating, crank heating and post heating. The ECM determines the heating times from the engine coolant temperature (ECT). The lower the ECT, the longer the heating times. If the engine coolant temperature (ECT) sensor fails, the ECM will use a predefined temperature as a default value.

The ECM monitors the feedback from the glow plug modules. If a fault is detected, the ECM stores a related fault code and permanently illuminates the glow plug indicator while the ignition is on.

PRE-HEATING

Pre-heat is the length of time the glow plugs operate prior to engine cranking. The ECM controls the pre-heat time based on ECT sensor output and barometric pressure. The pre-heat duration is extended if the coolant temperature is low.

When the ignition is in power mode 9 (ignition on), the ECM calculates any required heating times and, if heating is required, supplies power to the glow plug modules which in turn supply power to the glow plugs. When pre heating is required, the ECM also sends a message to the instrument cluster, on the high speed controller area network (CAN), to request illumination of the glow plug indicator. The glow plug indicator remains illuminated for the duration of the pre heating phase, or until the engine crank is requested, whichever occurs first. If required, the ECM keeps the glow plug module supplied with power during cranking and for the duration of any post heating phase.

The BARO (barometric pressure) also has an influence on activation and deactivation of the glow plugs in the event of large altitude differences.

CRANK HEATING

Crank heating is carried out at every start where the coolant temperature is below the predefined threshold of 20° C. Crank heating begins if the engine speed exceeds 42 rpm for longer than 50 ms, or the starter is active for longer than 4 sec. If the coolant temperature sensor is defective, a default temperature of 0° C is used.

POST HEATING

Post heat is the length of time the glow plugs operate after the engine starts. The ECM controls the post heating time based on ECT sensor output. The post heat phase reduces engine noise, improves idle quality and reduces hydrocarbon emissions.

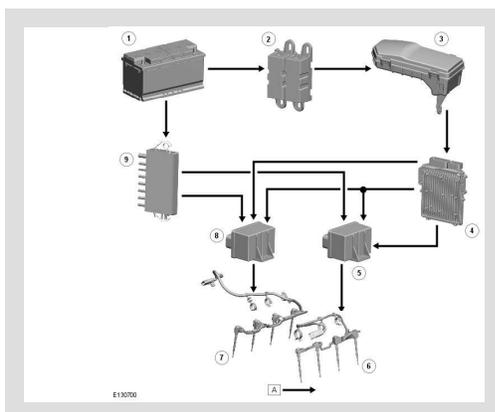
Preheating is followed by the post heating phase once the engine has started. The post heating phase depends upon how the vehicle is driven.

In addition to ECT, BARO and engine speed, the injected fuel quantity is significant in this context. For example, if the injected fuel quantity is less than 70 mg per piston stroke and the coolant temperature is below -20°C, post heating is performed.

CONTROL DIAGRAM

NOTE:

A = Hardwired



ITEM	DESCRIPTION
1	Battery
2	Battery Junction Box (BJB) 2
3	Engine Junction Box (EJB)
4	Engine Control Module (ECM)
5	Glow plug module
6	Glow plugs - LH bank (4 off)
7	Glow plugs - RH bank (4 off)
8	Glow plug module
9	Battery Junction Box (BJB)